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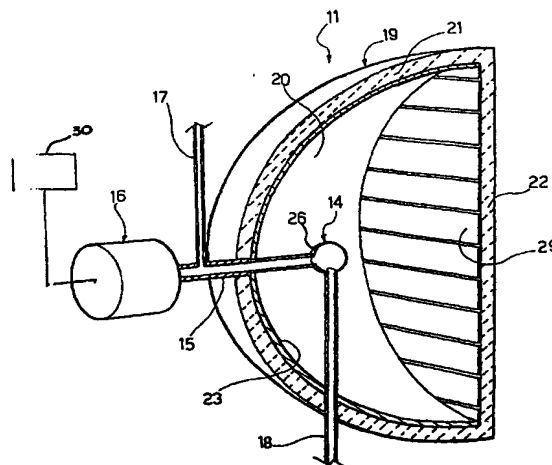
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(54) Title: A MICRO-COMBUSTOR SYSTEM FOR THE PRODUCTION OF ELECTRICAL ENERGY



(57) Abstract: A system for the production of electrical energy, comprising: a combustion chamber (14) made of material that is able to withstand high temperatures, an injection device (16) connected to said combustion chamber (14) by means of an injection conduit (15), means (17) for supplying combustion support substance into the combustion chamber (14) and means (18) for the removal of gaseous combustion products, means (26) for the selective emission of radiation onto the outer surface of the combustion chamber (14). The combustion chamber (14) is enclosed in a conversion chamber (20) within which are maintained at sub-atmospheric pressure conditions, so that a substantial part of the heat developed by the combustion reaction is converted into electromagnetic radiation. The radiation emitted inside the conversion chamber (20) impacts on conversion means (24) which convert electromagnetic radiation into electric energy. Said conversion means are preferably constituted by photovoltaic cells with a band gap in the order of 0.5 -0.8eV.

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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EPO-Internal, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 179 856 A (ABB RESEARCH LTD) 13 February 2002 (2002-02-13) the whole document	1,4,5, 12,28, 33,34
A	EP 1 179 855 A (ABB RESEARCH LTD) 13 February 2002 (2002-02-13) the whole document	1,4,5, 12,28, 33,34
A	US 6 372 979 B1 (STREETMAN FOY) 16 April 2002 (2002-04-16) the whole document	1,2,4-6, 12,13, 19,28,37
A	US 4 776 895 A (GOLDSTEIN ET AL) 11 October 1988 (1988-10-11) ----- -/--	

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☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 331 707 A (WERTH JOHN J) 18 July 1967 (1967-07-18) -----	
A	US 5 700 332 A (BROWN ET AL) 23 December 1997 (1997-12-23) -----	

INTERNATIONAL SEARCH REPORT

IP/03/04908

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 1179856	A	13-02-2002	EP	1179856 A1	13-02-2002
			AU	8975601 A	18-02-2002
			WO	0213280 A1	14-02-2002
			US	2004160710 A1	19-08-2004
EP 1179855	A	13-02-2002	EP	1179855 A1	13-02-2002
US 6372979	B1	16-04-2002	NONE		
US 4776895	A	11-10-1988	NONE		
US 3331707	A	18-07-1967	NONE		
US 5700332	A	23-12-1997	NONE		